Size and Strain Dependence of the Permeability of Ni_3Fe Nanocrystals

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Magnetic permeabilities were measured at microwave frequencies for Ni3Fe nanocrystals prepared by mechanical attrition. The nanocrystals studied included as-milled (6 nm and 11 nm sized) nanocrystals and nanocrystals which had been heat treated to increase crystal size. The complex permeability of the nanocrystals was measured at 8.9 GHz using the cavity perturbation method. The results show a strong correlation between grain size and the real component of the permeability, with the small sized nanocrystals (6 nm) having a real component 4 ti mcs larger than both powder and compressed pellet form were also used to obtain the permeability. The permeability for the pellet samples showed a 50% increase compared to the powder sample. This augmentation probably originates from the additional strain in the pellets due to compression. The permeability of nanocrystals is sensitive to both grain size and strain.

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